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| EXAMINER |
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MUHAMMED, ABDUKADER S

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| ART UNIT | PAPER NUMBER |
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2627

| SHORTENED STATUTORY PERIOD OF RESPONSE | NOTIFICATION DATE | DELIVERY MODE |
|--|-------------------|---------------|
| 3 MONTHS | 04/05/2007 | ELECTRONIC |

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 04/05/2007.

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| | | | |
|------------------------------|---------------------------------------|-------------------------------------|--|
| Office Action Summary | Application No. 10/786,047 | Applicant(s) HUANG ET AL. | |
| | Examiner Abdukader Muhammed | Art Unit 2627 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Specification

2. The disclosure is objected to because of the following informalities:

Page 4, line 23 and page 5, line 1, "a magneto-resistive head **40**" should be "a magneto-resistive head **20**" to be consistent with figures 1 and 2.

Appropriate correction is required.

Claim Objections

3. Claim 1 is objected to because of the following informalities:

In claim 1, line 9 "writes the data on the recording **payer**" should be "writes the data on the recording **layer**".

Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-6, 8, 10-16, 18, and 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wakabayashi et al. (US 6,970,400 B1) in view of J. Guerra et al. (Jpn. J. Appl. Phys, vol.41, pp.1866-1875).

Regarding Claim 1, Wakabayashi et al. teach a high-density thermal recording and magnetic reading recording medium containing data written by a near-field optical laser (the recordation of information on a magneto-optical recording medium involves scanning the recording medium with a laser beam; see column 2, lines 35-40) and readable by a magneto-resistive head (information is reproduced from the magneto-optical recording medium by a magnetic head on which a magneto-resistance element is mounted; see column 2, lines 44-51), comprising: a substrate (substrate 100; see figure 1 and 6); a recording layer formed on one side of the substrate (recording film 101; see figure 1 and 6); wherein the near-field optical laser writes the data on the recording layer and generates a near-field optical effect to shrink the dimension of optical spots and increase the recording density of the recording layer (a solid immersion lens 110 is used to create a near-field optical laser for high density recording; see figure 1 and column 8, lines 62-67 and the abstract, lines 1-8), the data written on the recording layer being readable by the magneto-resistive head (information is reproduced from the magneto-optical recording medium by a magnetic head on which a magneto-resistance element is mounted; see column 2, lines 44-51). Wakabayashi et al. differ from the claimed invention in that it does not include a plurality of sub-micro cylindrical lenses formed between the substrate and the recording layer.

J. Guerra et al. on the other hand teach a plurality of sub-micro cylindrical lenses (embedded nano-optical lenses) formed between the substrate and the recording layer (see figure 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used embedded micro-lenses in the system of Wakabayashi et al. since J. Guerra et

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al. teach that by using embedded lenses the track pitch density of DVD is doubled without resorting to blue lasers or flying heads (see page 1866, column 2, second paragraph, lines 1-3).

Regarding Claim 2, as applied to claim 1 above, J. Guerra et al. and Wakabayashi et al. inherently teach that the substrate can be made from glass or polycarbonate resins. Note that if a light beam is irradiated from the substrate side (as shown in figure 7 of Wakabayashi et al. and figure 1 of J. Guerra et al.), the substrate has to be transparent and for this purpose glass and polycarbonate resins are well known in the art.

Regarding Claim 3, as applied to claim 1 above, J. Guerra et al. also teach the sub-micro cylindrical lenses have an effective numerical aperture greater than 1.1 (see page 1866, column 1, second paragraph, lines 6-11).

Regarding Claim 4, as applied to claim 3 above, J. Guerra et al. also teach the sub-micro cylindrical lenses are solid immersion lenses (nOptic lenses are made from ZnS/SiO₂ or TiO₂ (refractive indices of 2.1 and 2.4, respectively) and also higher index materials such as GaP, this inherently shows the lenses are solid immersion lenses; see page 1866, column 1, second paragraph, lines 18-24).

Regarding Claim 5, as applied to claim 4 above, J. Guerra et al. also teach the sub-micro cylindrical lenses are made from a material selecting from a group consisting of ZnS, SiO₂ and SiNx (the lenses are made from ZnS/SiO₂, TiO₂, GaP; see page 1866, column 1, second paragraph, lines 18-24)

Regarding Claim 6, as applied to claim 1 above, Wakabayashi et al. also teach the recording layer is a magnetic recording film (the recording film 101 may be either an in-plane magnetic film or a perpendicular magnetic film; see column 9, lines 24-27).

Regarding Claim 8, as applied to claim 1 above, Wakabayashi et al. also teach the recording layer is a magnetic optical recording layer (a magneto-optical fusional system that employs a magneto-optical medium as an optical recording medium; see column 2, lines 31-44).

Regarding Claim 10, as applied to claim 1 above, Wakabayashi et al. also teach the recording layer is magnetized in a direction normal to the surface of the recording layer (the magnetization marks are perpendicular to the surface of the recording layer; see figure 1 and column 9, lines 24-27).

Regarding Claim 11, Wakabayashi et al. teach a high-density thermal recording and magnetic reading system, comprising: a recording medium which includes a substrate (substrate 100; see figure 1 and 6), a recording layer formed on the substrate (recording film 101; see figure 1 and 6); a near-field optical laser located on one side of the recording medium for recording data on the recording layer and generating a near-field optical effect to shrink the dimension of optical spots to increase the recording density of the recording layer (a solid immersion lens 110 is used to create a near-field optical laser for high density recording; see figure 1 and column 8, lines 62-67 and the abstract, lines 1-8); and a magneto-resistive head located on another side of the recording layer to read the data written on the recording layer (a magnetic head on which a magneto-resistance element is mounted for reproduction; see column 2, lines 44-51). Note that the optical head may be positioned on one side of the recording medium while the magnetic heads may be positioned on the other side (see column 7, lines 41-44). Wakabayashi et al. differ from the claimed invention in that it does not include a plurality of sub-micro cylindrical lenses formed between the substrate and the recording layer.

J. Guerra et al. on the other hand teach a plurality of sub-micro cylindrical lenses (embedded nano-optical lenses) formed between the substrate and the recording layer (see figure 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used embedded micro-lenses in the system of Wakabayashi et al. since J. Guerra et al. teach that by using embedded lenses the track pitch density of DVD is doubled without resorting to blue lasers or flying heads (see page 1866, column 2, second paragraph, lines 1-3).

Regarding Claim 12, as applied to claim 11 above, J. Guerra et al. and Wakabayashi et al. inherently teach that the substrate can be made from glass or polycarbonate resins. Note that if a light beam is irradiated from the substrate side (as shown in figure 7 of Wakabayashi et al. and figure 1 of J. Guerra et al.), the substrate has to be transparent and for this purpose glass and polycarbonate resins are well known in the art.

Regarding Claim 13, as applied to claim 11 above, J. Guerra et al. also teach the sub-micro cylindrical lenses have an effective numerical aperture greater than 1.1 (see page 1866, column 1, second paragraph, lines 6-11).

Regarding Claim 14, as applied to claim 13 above, J. Guerra et al. also teach the sub-micro cylindrical lenses are solid immersion lenses (nOptic lenses are made from ZnS/SiO₂ or TiO₂ (refractive indices of 2.1 and 2.4, respectively) and also higher index materials such as GaP, this inherently shows the lenses are solid immersion lenses; see page 1866, column 1, second paragraph, lines 18-24).

Regarding Claim 15, as applied to claim 14 above, J. Guerra et al. also teach the sub-micro cylindrical lenses are made from a material selecting from a group consisting of ZnS, SiO₂

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and SiNx (the lenses are made from ZnS/SiO₂, TiO₂, GaP; see page 1866, column 1, second paragraph, lines 18-24)

Regarding Claim 16, as applied to claim 11 above, Wakabayashi et al. also teach the recording layer is a magnetic recording film (the recording film 101 may be either an in-plane magnetic film or a perpendicular magnetic film; see column 9, lines 24-27).

Regarding Claim 18, as applied to claim 11 above, Wakabayashi et al. also teach the recording layer is a magnetic optical recording layer (a magneto-optical fusional system that employs a magneto-optical medium as an optical recording medium; see column 2, lines 31-44).

Regarding Claim 20, as applied to claim 11 above, Wakabayashi et al. also teach the recording layer is magnetized in a direction normal to the surface of the recording layer (the magnetization marks are perpendicular to the surface of the recording layer; see figure 1 and column 9, lines 24-27).

Regarding Claim 21, as applied to claim 11 above, Wakabayashi et al. also teach the magneto-resistive head is selectively a giant magneto-resistive head or a tunneling magneto-resistance head (reproducing apparatus may be an MR head or a GMR head; see column 6, lines 49-53).

6. Claims 7, 9, 17, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wakabayashi et al. (US 6,970,400 B1) in view of J. Guerra et al. (Jpn. J. Appl. Phys, vol.41, pp.1866-1875) as applied to claims 6 and 16 above, further in view of Nemoto et al. (Jpn. J. Appl. Phys. Vol.38 (1999) pp.1841-1842).

Regarding Claim 7, the combination of Wakabayashi et al. and J. Guerra et al. teach the limitations claim 6 for the reasons discussed above. The combination of Wakabayashi et al. and

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J. Guerra et al. differ from the claimed invention in that it does not show that the magnetic recording film has a reading layer located on top of it.

Nemoto et al. on the hand teach a read out layer on top of the recording/memory layer (see page 1841, table I). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a read out layer in the system of the combination of Wakabayashi et al. and J. Guerra et al. since Nemoto et al. teach that using a read out layer has desirable characteristics such as large magnetization at room temperature to provide high flux density and large perpendicular anisotropy to ensure an accurate copy (see page 1841, first column, sixth paragraph, lines 5-10).

Regarding Claim 9, the combination of Wakabayashi et al. and J. Guerra et al. teach the limitations claim 8 for the reasons discussed above. The combination of Wakabayashi et al. and J. Guerra et al. differ from the claimed invention in that it does not show that the magnetic recording film has a reading layer located on top of it.

Nemoto et al. on the hand teach a read out layer on top of the recording/memory layer (see page 1841, table I). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a read out layer in the system of the combination of Wakabayashi et al. and J. Guerra et al. since Nemoto et al. teach that using a read out layer has desirable characteristics such as large magnetization at room temperature to provide high flux density and large perpendicular anisotropy to ensure an accurate copy (see page 1841, first column, sixth paragraph, lines 5-10).

Regarding Claim 17, the combination of Wakabayashi et al. and J. Guerra et al. teach the limitations claim 16 for the reasons discussed above. The combination of Wakabayashi et al. and

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J. Guerra et al. differ from the claimed invention in that it does not show that the magnetic recording film has a reading layer located on top of it.

Nemoto et al. on the hand teach a read out layer on top of the recording/memory layer (see page 1841, table I). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a read out layer in the system of the combination of Wakabayashi et al. and J. Guerra et al. since Nemoto et al. teach that using a read out layer has desirable characteristics such as large magnetization at room temperature to provide high flux density and large perpendicular anisotropy to ensure an accurate copy (see page 1841, first column, sixth paragraph, lines 5-10).

Regarding Claim 19, the combination of Wakabayashi et al. and J. Guerra et al. teach the limitations claim 18 for the reasons discussed above. The combination of Wakabayashi et al. and J. Guerra et al. differ from the claimed invention in that it does not show that the magnetic recording film has a reading layer located on top of it.

Nemoto et al. on the hand teach a read out layer on top of the recording/memory layer (see page 1841, table I). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a read out layer in the system of the combination of Wakabayashi et al. and J. Guerra et al. since Nemoto et al. teach that using a read out layer has desirable characteristics such as large magnetization at room temperature to provide high flux density and large perpendicular anisotropy to ensure an accurate copy (see page 1841, first column, sixth paragraph, lines 5-10).

Conclusion

7. The prior art made of record in PTO-892 Form and not relied upon is considered pertinent to applicant's disclosure.

Guerra (US 6094413 and US 5910940) teach an optical storage system suitable for optical storage and retrieval of information using a storage medium comprising a substrate, an active layer for retention of the data, and an overlying optical layer, or layers for double-sided. The optical layer serves to produce an evanescent field in or adjacent to the active layer in response to an incident beam of radiation (see figure 7).

S. Tsunashima (J. Phys. D: Appl. Phys. **34** (2001) R87-R102) teaches a hybrid-recording medium that combines thermo-magnetic recording and magnetic flux readout using a magneto-resistance (MR) head (see figure 24).

H. Sakeda et al. (IEEE TRANSACTIONS ON MAGNETICS, VOL. 37, NO. 4, JULY 2001 pp. 1234-1238) tech hybrid recording medium that combining hard-disk-drive (HDD) technologies and magneto-optical (MO) disk-drive technologies. HDD technology enables high-resolution and high-sensitivity detection by using a flux detector such as a giant magneto-resistive (GMR) device. MO technology enables the formation of perpendicular magnetic domains in a rare-earth-transition-metal (RE-TM) amorphous film (see figure 2, 5, and 6).

Vezenov et al. (US Pub. 2002/0154590 A1) tech an optical data storage medium which includes a superstructure of micro-lenses formed on the recording medium (see figure 2).

Vezenov et al. (US Pub. 2002/0168592 A1) tech a method for manufacturing hemi-cylindrical and hemi-spherical micro-structures (see figure 1).

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Yoshida et al. (US 6778471 B1) teach magneto-optical recording medium with improved efficiency of magnetic reproduction, and high-output as well as high-SN-ratio reproduction at high linear recording density (see figures 2 and 3).

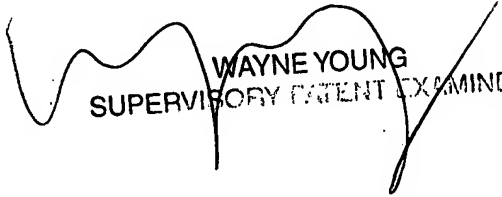
8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Abdukader Muhammed whose telephone number is (571) 270-1226. The examiner can normally be reached on Monday-Thursday 8:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wayne Young can be reached on (571) 272-7582. Customer Service can be reached at (571) 272-2600. The fax number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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26 March 2007


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